

WHAT IS CLAIMED IS:

1. A projector type vehicle headlamp comprising:

a light source;

a reflector including a reflection surface for reflecting light from the light source;

5 and

a condenser lens that irradiates reflected light from the reflection surface

forwards, wherein

the reflection surface includes a plurality of segments, and is formed of a free-form surface obtained by deforming a reference ellipsoid of revolution,

10 the light source is arranged between a first focal point of the reference ellipsoid of revolution and the condenser lens, closer to the first focal point than to the condenser lens, and

segments forming one end and other end portions of a light distribution pattern include a wide area-illuminating reflection surface that makes the one end and the
15 other end portions substantially a rectangular shape, wherein the other end portion is opposite to the one end portion with respect to a center of the light distribution pattern.

2. The vehicle headlamp according to claim 1, wherein the reflection surface includes

20 a first segment that forms diffused light at a center portion of the light distribution pattern;

a second segment that forms spot light at the center portion;

a third segment that forms the one end portion; and

a fourth segment that forms the other end portion.

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3. The vehicle headlamp according to claim 1, wherein the reflection surface is formed of a free-form surface obtained by stretching the reference ellipsoid of revolution in one direction and pushing down the reference ellipsoid of revolution in other direction perpendicular to the one direction to deform the reference ellipsoid of revolution.
4. The vehicle headlamp according to claim 1, wherein the segments forming the one end and the other end portions further include a diffuse reflection surface that diffuses edges of the one end and the other end portions formed substantially in a rectangular shape by the wide area-illuminating reflection surfaces.
5. The vehicle headlamp according to claim 1, wherein the segments forming the one end and the other end portions further include a diffuse reflection surface that diffuses edges of the one end and the other end portions formed substantially in a rectangular shape by the wide area-illuminating reflection surfaces, and a portion of the diffuse reflection surface, where the light from the light source is not effectively used when a predetermined light distribution pattern for a low beam is formed, includes a luminous intensity-improving reflection surface that increases luminous intensity at the one end and the other end portions formed substantially in a rectangular shape by the wide area-illuminating reflection surface.
6. A reflector for a projector type vehicle headlamp, comprising: a reflection surface that reflects light from a light source toward a condenser lens, wherein

the reflection surface includes a plurality of segments, and is formed of a free-form surface obtained by deforming a reference ellipsoid of revolution,

the light source is arranged between a first focal point of the reference ellipsoid of revolution and the condenser lens, closer to the first focal point than to the

5 condenser lens, and

segments forming one end and other end portion of a light distribution pattern include a wide area-illuminating reflection surface that makes the one end and the other end portions substantially a rectangular shape, wherein the other end portion is opposite to the one end portion with respect to a center of the light distribution pattern.

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7. The reflector according to claim 6, wherein the reflection surface includes a first segment that forms diffused light at a center portion of the light distribution pattern;

a second segment that forms spot light at the center portion;

15 a third segment that forms the one end portion; and

a fourth segment that forms the other end portion.

8. The reflector according to claim 6, wherein the reflection surface is formed of a free-form surface obtained by stretching the reference ellipsoid of revolution in one direction and pushing down the reference ellipsoid of revolution in other direction perpendicular to the one direction to deform the reference ellipsoid of revolution.

9. The reflector according to claim 6, wherein the segments forming the one end and the other end portions further include a diffuse reflection surface that diffuses edges of the one end and the other end portions formed substantially in a rectangular

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shape by the wide area-illuminating reflection surfaces.

10. The reflector according to claim 6, wherein

the segments forming the one end and the other end portions further include a
5 diffuse reflection surface that diffuses edges of the one end and the other end portions
formed substantially in a rectangular shape by the wide area-illuminating reflection
surfaces, and

a portion of the diffuse reflection surface, where the light from the light source
is not effectively used when a predetermined light distribution pattern for a low beam is
10 formed, includes a luminous intensity-improving reflection surface that increases
luminous intensity at the one end and the other end portions formed substantially in a
rectangular shape by the wide area-illuminating reflection surface.

11. A computer program for designing a reflector for a projector type vehicle
15 headlamp, the program making a computer execute:

determining, based on size data of a reference reflector input, a reference box
with a front side being open;

defining, from a quadratic equation for a rational B-spline surface, a reference
ellipsoid of revolution that is fit in the reference box;

20 determining control points of the reference box;

setting, based on position data of the light source input, a position of a light
source between a first focal point of the reference ellipsoid of revolution and a
condenser lens, closer to the first focal point than to the condenser lens;

deforming the reference ellipsoid of revolution by stretching the reference
25 ellipsoid of revolution in one direction and pushing down the reference ellipsoid of

revolution in other direction perpendicular to the one direction by shifting, based on shift data input, the control points of the reference box; and

5 setting a weight of the control point that is involved in a control of one end and other end portions of a light distribution pattern obtained by a reflection surface of the ellipsoid of revolution deformed to be smaller than a value used when defining the ellipsoid of revolution to provide a wide area-illuminating reflection surface, which forms the one end and the other end portions substantially in a rectangular shape, on the reflection surface, wherein the other end portion is opposite to the one end portion with respect to a center of the light distribution pattern.

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12. A computer program for designing a reflector for a projector type vehicle headlamp, the program making a computer execute:

 determining, based on size data of a reference reflector input, a reference box with a front side being open;

15 defining, from a quadratic equation for a rational B-spline surface, a reference ellipsoid of revolution that is fit in the reference box;

 determining control points of the reference box;

 setting, based on position data of the light source input, a position of a light source between a first focal point of the reference ellipsoid of revolution and a
20 condenser lens, closer to the first focal point than to the condenser lens;

 deforming the reference ellipsoid of revolution by stretching the reference ellipsoid of revolution in one direction and pushing down the reference ellipsoid of revolution in other direction perpendicular to the one direction by shifting, based on first shift data input, the control points of the reference box;

25 setting a weight of the control point that is involved in a control of one end and

other end portions of a light distribution pattern obtained by a reflection surface of the ellipsoid of revolution deformed to be smaller than a value used when defining the ellipsoid of revolution to provide a wide area-illuminating reflection surface, which forms the one end and the other end portions substantially in a rectangular shape, on the reflection surface, wherein the other end portion is opposite to the one end portion with respect to a center of the light distribution pattern;

increasing, based on increase data input, number of the control points; and controlling locally the wide area-illuminating reflection surface by shifting, based on second shift data input, the control points increased to form a diffuse reflection surface, which diffuses the one end and the other end portions formed substantially in a rectangular shape by the wide area-illuminating reflection surface to far sides from the center, respectively, on the reflection surface.

13. A computer program for designing a reflector for a projector type vehicle headlamp, the program making a computer execute:

determining, based on size data of a reference reflector input, a reference box with a front side being open;

defining, from a quadratic equation for a rational B-spline surface, a reference ellipsoid of revolution that is fit in the reference box;

determining control points of the reference box;

setting, based on position data of the light source input, a position of a light source between a first focal point of the reference ellipsoid of revolution and a condenser lens, closer to the first focal point than to the condenser lens;

deforming the reference ellipsoid of revolution by stretching the reference ellipsoid of revolution in one direction and pushing down the reference ellipsoid of

revolution in other direction perpendicular to the one direction by shifting, based on first shift data input, the control points of the reference box;

5 setting a weight of the control point that is involved in a control of one end and other end portions of a light distribution pattern obtained by a reflection surface of the ellipsoid of revolution deformed to be smaller than a value used when defining the ellipsoid of revolution to provide a wide area-illuminating reflection surface, which forms the one end and the other end portions substantially in a rectangular shape, on the reflection surface, wherein the other end portion is opposite to the one end portion with respect to a center of the light distribution pattern;

10 increasing, based on increase data input, number of the control points; controlling locally the wide area-illuminating reflection surface by shifting, based on second shift data input, the control points increased to form a diffuse reflection surface, which diffuses the one end and the other end portions formed substantially in a rectangular shape by the wide area-illuminating reflection surface to far sides from the center, respectively, on the reflection surface; and

15 forming a luminous intensity-improving reflection surface, which improves luminous intensity of the one end and the other end portions formed substantially in a rectangular shape by the wide area-illuminating reflection surface and diffused by the diffuse reflection surface, on a portion of the diffuse reflection surface where light from a light source is not effectively used when a predetermined light distribution pattern for low beam is formed.